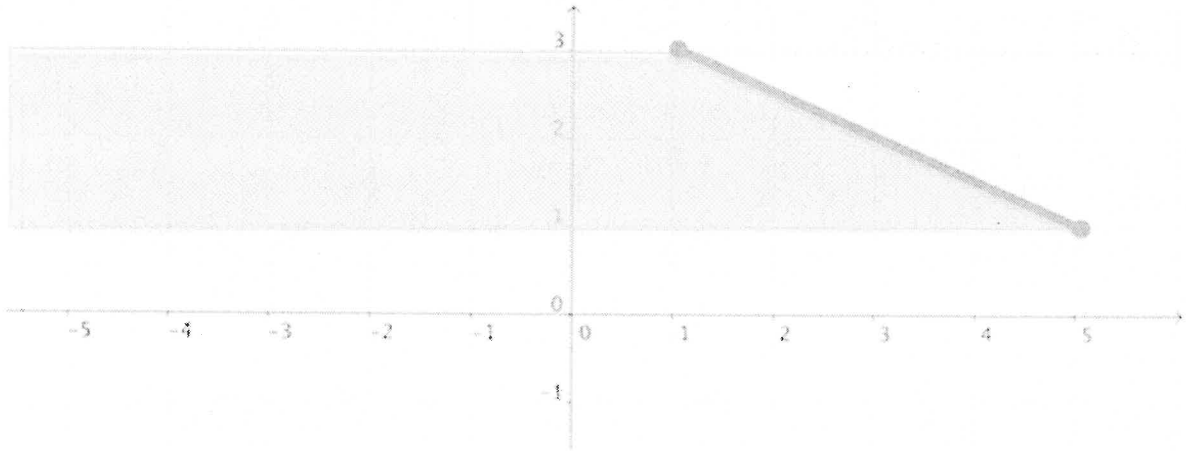
p. 293 5.5 #1,2

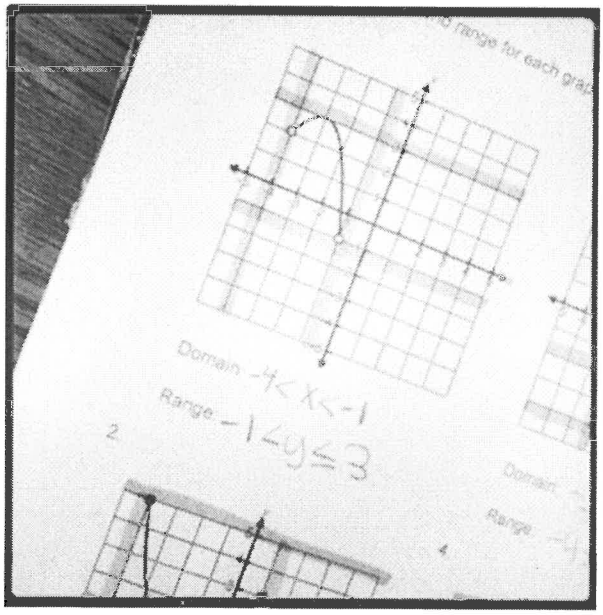
1. I decide whether values of both the independent and dependent variables that lie between the given points make sense. If the values make sense lif they exist.. if it's logical and reasonable to have values between the given points), I join the points. For example, in a graph of temperature against time, I would connect the dots because there are temperatures and times between the given points.

If the values between the given values do not make sense (if they don't exist), I don't join the points. For example of a graph of cost of tickets, there are no half tickets. There are no values that exist between 1 ticket and 2 tickets.

2. When the entire function is shown on a graph, I can determine the domain of a function by visualizing its shadow on the x-axis, and I can determine the range of a function by visualizing its shadow on the y-axis. (or drawing in the shadow lightly).



Another idea to try is using a highlighter to draw vertical lines at each of the boundary points for the x. That shows the starting and stopping points of the domain (if there's an arrow, one of the points will be ∞ or -∞).



Use a different colour to draw horizontal lines at each of the boundary points for the y. This is the starting and stopping points of the range.

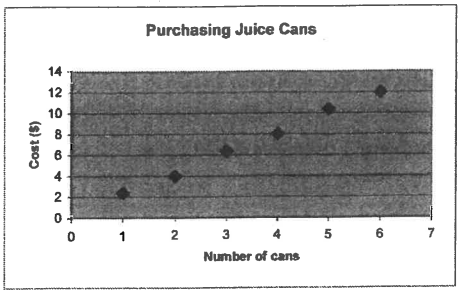
When the graph is a set of points, I write each of the domain and range as a set of numbers, with squiggly brackets. (I can't use interval notation because a set of points are discrete values.

When the points are connected, I use inequality symbols ($\geq$ $\leq$ $<$ $>$) to write the domain and range. (Or I write in interval notation – I write the starting and stopping values in round or square brackets. This means the graph runs continuously between those values.)

If the graph continues beyond the grid (with an arrow), I assume the graph continues in the direction shown, to infinity or to negative infinity.

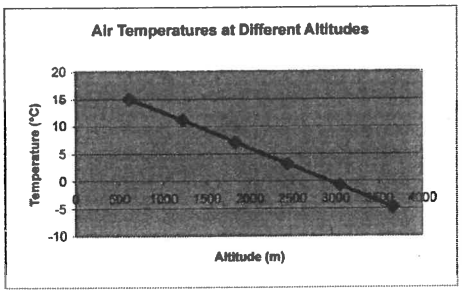
5-5 #1-8, 10-12, 16

2. **a)** Graph the data using a computer spreadsheet program. Label the axes.



The points are not joined because only whole numbers are permissible for the number of juice cans purchased.
The relation is a function because a vertical line drawn on the graph passes through at most 1 point on the graph.

b) Graph the data using a computer spreadsheet program. Label the axes.



The points on the graph are joined because the altitude could be any number of metres between 610 m and 3660 m and the temperature could be any number of degrees Celsius between –5°C and 15°C.
The relation is a function because a vertical line drawn on the graph passes through at most 1 point on the graph.

Lesson 5.5 Graphs of Relations and Functions Exercises (pages 294–297)

A

4. **a)** The domain is the set of x-coordinates of the points on the graph:
$\{-2, -1, 0, 1, 2\}$
The range is the set of y-coordinates of the points on the graph:
$\{-4, -2, 0, 2, 4\}$

b) The domain is the set of x-coordinates of the points on the graph:
$\{-3, -1, 0, 2, 3\}$
The range is the set of y-coordinates of the points on the graph:
$\{-2, 0, 1, 2, 3\}$

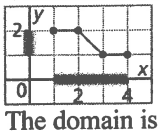
c) The domain is the set of x-coordinates of the points on the graph:
$\{-3, -2, -1, 0, 1, 2, 3\}$
The range is the set of y-coordinates of the points on the graph:
$\{2\}$

5. A vertical line drawn on each graph intersects the graph at 0 points or 1 point.

6. **a)** The graph of $y = 1$ represents a function because each point on the line has a different x-coordinate.

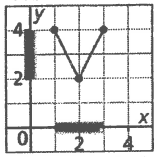
b) The graph of $x = 1$ does not represent a function because each point on the line has the same x-coordinate, 1.

7. a) Visualize the shadow of the graph on the x- and y-axes.



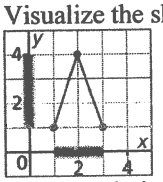
The domain is the set of x-values of the graph:
$1 \le x \le 4$
The range is the set of y-values of the graph:
$1 \le y \le 2$
So, match part a with part iv.

b) Visualize the shadow of the graph on the x- and y-axes.



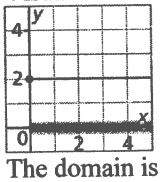
The domain is the set of x-values of the graph:
$1 \le x \le 3$
The range is the set of y-values of the graph:
$2 \le y \le 4$
So, match part b with part i.

c) Visualize the shadow of the graph on the x- and y-axes.



The domain is the set of x-values of the graph:
$1 \le x \le 3$
The range is the set of y-values of the graph:
$1 \le y \le 4$
So, match part c with part ii.

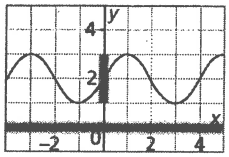
d) Visualize the shadow of the graph on the x- and y-axes.



The domain is the set of x-values of the graph:
$x \ge 0$
The range is the set of y-values of the graph:
$y = 2$
So, match part d with part iii.

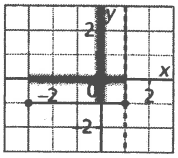
B

8. a) This graph is a function.
Any vertical line drawn on the graph passes through exactly 1 point.
Visualize the shadow of the graph on the x- and y-axes.

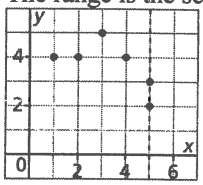


The domain is the set of x-values of the graph, which is the set of all real numbers. $\{x \mid x \in \mathbb{R}\}$ $(-\infty, \infty)$
The range is the set of y-values of the graph:
$\{1 \le y \le 3\}$ $[1, 3]$

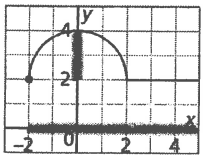
b) This graph is not a function. The vertical line $x = 1$ passes through many points on the graph. Visualize the shadow of the graph on the x- and y-axes.
The domain is the set of x-values of the graph: $\{-3 \le x \le 1\}$ $[-3, 1]$
The range is the set of y-values of the graph: $\{y \ge -1\}$ $[-1, \infty)$



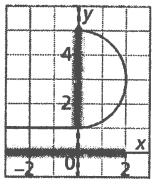
c) This graph is not a function. The vertical line $x = 5$ passes through the points (5, 2) and (5, 3) on the graph.
The domain is the set of x-values of the graph: {1, 2, 3, 4, 5}
The range is the set of y-values of the graph: {2, 3, 4, 5}



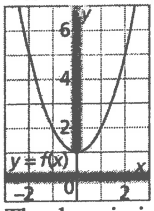
d) This graph is a function. It is not possible to draw a vertical line on the graph that passes through 2 points on the graph.
Visualize the shadow of the graph on the x- and y-axes.
The domain is the set of x-values of the graph:
$\{x \ge -2\}$ $[-2, \infty)$
The range is the set of y-values of the graph:
$\{2 \le y \le 4\}$ $[2, 4]$



e) This graph is not a function. The vertical line $x = 0$ passes through the points (0, 1) and (0, 5) on the graph. Visualize the shadow of the graph on the x- and y-axes.
The domain is the set of x-values of the graph: $\{x \le 2\}$ $(-\infty, 2]$
The range is the set of y-values of the graph: $\{1 \le y \le 5\}$ $[1, 5]$



9. a) Visualize the shadow of the graph on the x- and y-axes.

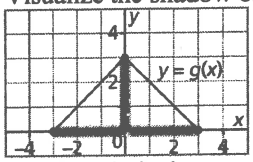


The domain is the set of x-values of the graph, which is the set of all real numbers. $\{x \mid x \in \mathbb{R}\}$ $(-\infty, \infty)$

The range is the set of y-values of the graph:

$\{y \geq 1\}$ $[1, \infty)$

b) Visualize the shadow of the graph on the x- and y-axes.



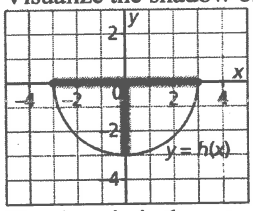
The domain is the set of x-values of the graph:

$\{-3 \leq x \leq 3\}$ $[-3, 3]$

The range is the set of y-values of the graph:

$\{0 \leq y \leq 3\}$ $[0, 3]$

c) Visualize the shadow of the graph on the x- and y-axes.



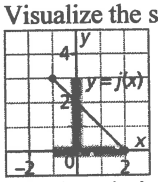
The domain is the set of x-values of the graph:

$\{-3 \leq x \leq 3\}$ $[-3, 3]$

The range is the set of y-values of the graph:

$-3 \leq y \leq 0$ $[-3, 0]$

d) Visualize the shadow of the graph on the x- and y-axes.



The domain is the set of x-values of the graph:

$\{-1 \leq x \leq 2\}$ $[-1, 2]$

The range is the set of y-values of the graph:

$\{0 \leq y \leq 3\}$ $[0, 3]$

10. a) The points on the graph should not be connected because the price is calculated per letter, and only whole numbers of letters are possible.

b) The points on the graph should be connected because the plane's altitude and travel time could be any positive number.

c) The points on the graph should be connected because the baby's mass and age could be any positive number.

d) The points on the graph should be connected because both a number and its cube root can be any real number.

11. a) **i)** The data in the graph represent the distance of a school bus from the school from 8:00 to 9:00.

ii) The data in the graph represent the number of students on a school bus from 8:00 to 9:00.

b) **i)** The independent variable is the time.
The dependent variable is the distance from the school.

ii) The independent variable is the time.
The dependent variable is the number of students.

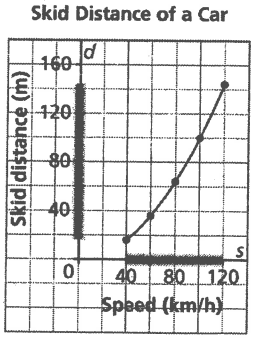
c) The points on graph A are connected because all values of time and distance are permissible between the indicated plotted points.
The points on graph B are not connected because it is impossible to have only part of a student on a bus.

12. a) The points on the graph are connected because the car's speed in kilometres per hour and the skid length in metres can be any positive number between the plotted points.

b) Visualize the shadow of the graph on the x- and y-axes.

The domain is the set of s-values of the graph:
$\{40 \le s \le 120\}$ [40, 120]
The range is the set of d-values of the graph:
approximately $\{16 \le d \le 144\}$ [16, 144]

The domain and range cannot contain negative numbers because it is impossible to have a negative skid distance or a negative speed. The domain is also restricted because the relationship shown on the graph may not be true for speeds less than 40 km/h and greater than 120 km/h.

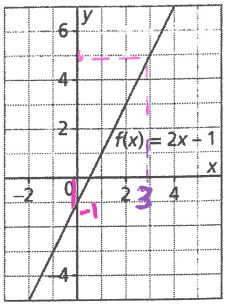


16. The domain value is a value of x. The range value is a value of $f(x)$.

a) To determine the value of $f(x)$ when $x = 0$:

When $x = 0$, $f(x)$ is the y-intercept, which is -1.

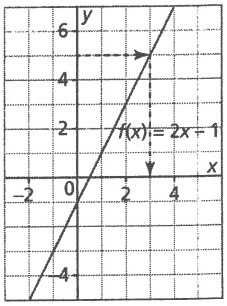
When the domain value is 0, the range value is -1.



b) To determine the value of x when $f(x) = 5$:

Begin at $f(x) = 5$ on the y-axis.
Draw a horizontal line to the graph,
then a vertical line to the x-axis.
The line intersects the x-axis at 3.
So, when $f(x) = 5$, $x = 3$

When the range value is 5, the domain value is 3.

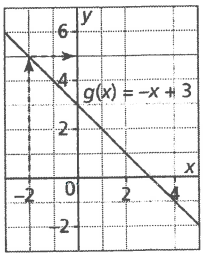


17. The domain value is a value of x. The range value is a value of $g(x)$.

a) To determine the value of $g(x)$ when $x = -2$:

Begin at $x = -2$ on the x-axis.
Draw a vertical line to the graph,
then a horizontal line to the y-axis.
The line intersects the y-axis at 5.
So, $g(-2) = 5$

When the domain value is -2, the range value is 5.



b) To determine the value of x when $g(x) = 0$:
When $g(x) = 0$, x is the x-intercept, which is 3.
When the range value is 0, the domain value is 3.